High-GWP Refrigerant Management Program for Stationary Sources

Public Workshop Meetings

- Diamond Bar – February 3rd
- Modesto – February 5th
- Sacramento – February 10th (Webcasted)

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Agenda

- Introduction to AB32 & the High-GWP Refrigerant Management Program
- Overview of Stationary Source High-GWP Sector
- Facilities Potentially Impacted by Proposed Rule and Potential Emission Reductions
- Discussion of Proposed Rule & Proposed Changes Under Consideration
- Emissions Inventory Methods & Discussion (Appendix A)
- Cost Analysis & Effectiveness Methods & Discussion (Appendix B)
- Emissions and Cost Analysis Case Studies
- Timeline & Next Steps
- Outstanding Policy Issues

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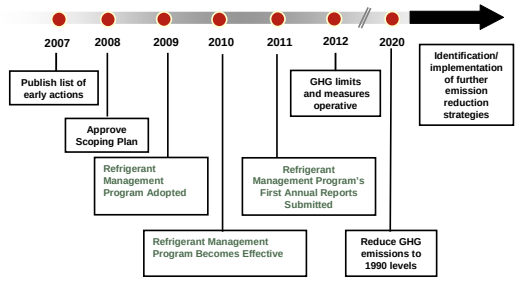
California Global Warming Solutions Act of 2006 (AB 32)



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Stationary Source High-GWP GHG Sector Overview

- **What Are High-Global Warming Potential (GWP) Gases**
  - Gases that may cause many times more global warming than equivalent weight of carbon dioxide (CO_2)
  - Kyoto Protocol Gases (HFCs)
  - Montreal Protocol Gases (ODSs)
  - Other Gases

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GWP of Kyoto and Non-Kyoto* Gases

GHG/Class	Global Warming Potential
Carbon Dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	140 to 11,700
Perfluorocarbons (PFCs)	6,500 to 9,200
Sulfur hexafluoride (SF_6)	23,900
Chlorofluorocarbons (CFCs)*	3,800 to 8,100
Hydrochlorofluorocarbons (HCFCs)*	90 to 1,800
Halons*	5,400
Ammonia	Not Applicable

HFCs, CFCs, and HCFCs are commonly used as refrigerants and the gases most applicable to the Refrigerant Management Program.

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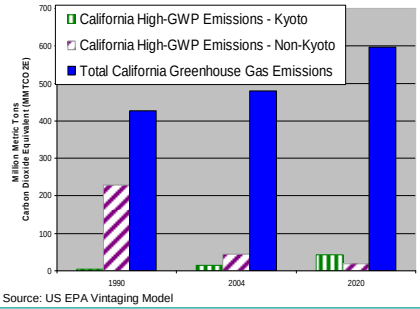
California High-GWP GHG Emissions



Source: US EPA Vintaging Model

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Leak Repair: focus on large equipment, e.g.,

Commercial building chillers & rooftop units

Supermarket systems

Industrial process refrigeration

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Estimated Number of Facilities Potentially Required to Repair all High-GWP Refrigerant Leaks, (Approx # CA)

Refrigerant Charge Size Category	Facilities with Large Systems (≥ 2,000 lbs)	Facilities with Medium Systems (≥ 200 lbs, <2,000 lbs)	Facilities with Small Systems (≥ 50 lbs, <200 lbs)
Low Range	9,000	56,000	128,000
High Range	11,000	76,000	173,000
Average Number Used in Analysis	10,000	66,000	150,000

Large Systems are represented by centralized (DX) refrigeration – most leaky systems

Medium Systems are represented by decentralized refrigeration systems and chillers for refrigeration and air conditioning

Small Systems represented by small refrigeration systems, chillers, and unitary air-conditioning systems.

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Facility Types Potentially Required to Repair all High-GWP Refrigerant Leaks

- Cold storage warehouses
- Food preparation/processing/service
- Grocery stores/supermarkets
- Office, commercial, and industrial buildings
- Hospitals and other medical facilities
- Military bases
- Institutions (schools, universities, laboratories, etc)
- Hotels, recreational facilities, etc
- Process cooling
- Telecommunications & data centers

Facilities using ammonia-based refrigeration systems are not impacted

Agricultural facilities are included in cold storage warehouses and food preparation/processing/service categories

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Estimated Potential Emission Reductions (2020)

(Assumes 100% Compliance and Meeting Target Leak Rates)

	Business as Usual Emissions ($MMTCO_2E$)	Potential Emission Reductions All Systems ($MMTCO_2E$)
Kyoto Only (HFCs Only)		
Low Range	21	11
High Range	28	14
Average Result	25	12
Kyoto & Non-Kyoto (HFCs & ODSs)		
Low Range	26	13
High Range	35	18
Average Result	31	15

All business as usual emissions and potential emission reductions provided in million metric tons of carbon dioxide equivalent ($MMTCO_2E$)

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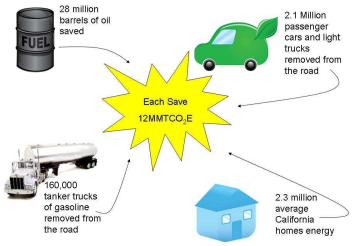
Another Look at Estimated Potential Emission Reductions

- The 12 $MMTCO_2E$ Potential Emission Reduction is Equivalent to:



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Goal: Minimize emissions of high GWP refrigerants from stationary refrigeration and air conditioning equipment through:

- Leak Detection and Monitoring
- Leak Repair
- Refrigeration and Air-Conditioning System Retrofit and Retirement Required Service Practices
- Reporting by facilities and refrigerant distributors and reclaimers
- *Builds on Federal Rule 608 and SCAQMD Rule 1415*

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Refrigerant Management Program Outreach Activities To Date

Outreach Activities	Timeframe
Early Action Measures Final Report Released	October-07
Draft and Final Scoping Plan	June & October 2008
High-GWP Sector Public Workshop	February 2008
Monthly CAPCOA Meetings and Meetings with SCAQMD	Throughout 2008
Individual Stakeholder Meetings (12 Stakeholder meetings)	February - December 2008
Technical Workgroup Meetings	April, May, July 2008 & January 2009
Draft Proposed Rule Versions Released for Comments	July, September 2008 & January 2009
Site Visits to Facilities (4 Site Visits)	March - August 2008
Refrigerant Management Program First Public Workshops (3 cities)	September 2008

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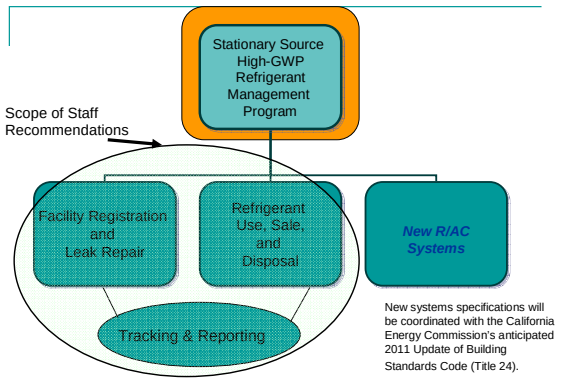

New systems specifications will be coordinated with the California Energy Commission's anticipated 2011 Update of Building Standards Code (Title 24).

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Proposed Rule Applicability by Subject

	Facilities	R/AC Systems	Certified Technicians	Distributors and Wholesalers	Certified Reclaimers
Facility Registration and Leak Repair					
Registration for Operation	X				
Leak Detection and Monitoring		X			
Leak Repair		X			
Retrofit & Retirement Plans		X			
Required Service Practices	X		X		
Reporting	X	X			
Recordkeeping	X	X			
Refrigerant Use, Sale, and Disposal					
Prohibitions			X	X	X
Reporting				X	X
Recordkeeping				X	X

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Proposed Rule Implementation Schedule by Subject

	Facilities with Large Systems	Facilities with Medium Systems	Facilities with Small Systems	Refrigerant Distributors, Wholesalers and Reclaimers
Facility Registration and Leak Repair				
Leak Detection and Monitoring		**2010**		
Leak Repair		**2010**		
Retrofit & Retirement Plans		**2010**		
Required Service Practices		**2010**		
Registration for Operation	**2011**	**2013**	**2014**	
Reporting	**2011**	**2013**	**N/A**	
Recordkeeping	**2010**	**2010**	**2010**	
Refrigerant Use, Sale, and Disposal				
Prohibitions				**2010**
Reporting				**2011**
Recordkeeping				**2010**

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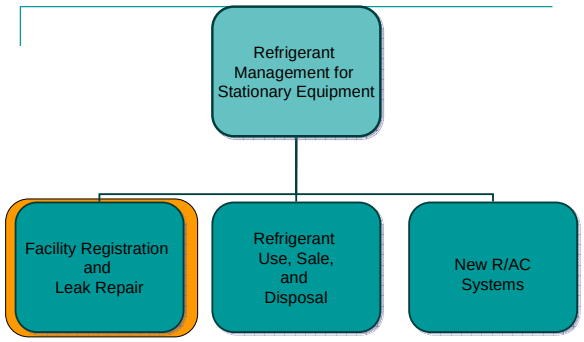

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Leak Detection and Monitoring

Refrigerant Charge Size Category	Requirement
Facilities with Large System(s)	Automatic Leak Detection System
Facilities with Medium System(s)	Quarterly Inspection
Facilities with Small System(s)	Annual Inspection

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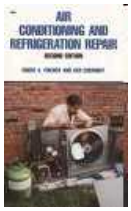
Leak Repair and Retrofit and Retirement Plans



- Refrigerant Leak Repairs Required by a U.S. EPA Certified Technician within 14 days of leak detection
  - Up to 60 days allowed if certain conditions apply
- Verification tests
  - Immediate initial verification test required on leak repair
  - Follow-up verification tests required for entire R/AC system
- Retrofit or Retirement Plan required for R/AC System if not repairable

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Required Service Practices

- Practices in Code of Federal Regulations
  - No discharge of refrigerant from refrigerant circuit (no venting)
  - Refrigerant recovery using approved recovery/recycling equipment
  - Technician must hold a valid U.S. EPA certificate
  - Refrigerant recovery using approved equipment and procedures.
  - Service of refrigeration or air-conditioning systems consistent with US EPA certification.
- Practices Not Specific to Code of Federal Regulations
  - Use of approved refrigerants (U.S. EPA or Executive Officer)
  - Refrigerant cylinder evacuation
  - No topping off

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Certified Technician

- What Are Requirements for Technician Certification?
  1. Holds a valid certificate issued by a training program certified by the U.S. EPA in one of the following categories:
     - Type I - Technician certificate for small appliances; or
     - Type II - Technician certificate for high or very high pressure refrigeration systems; or
     - Type III - Technician certificate for low pressure refrigeration systems; or
     - A Universal Technician certificate.
  2. Holds a current and active California contractors license:
     - Is a licensed California contractor, or
     - Is an employee of a person holding a current and active California contractors license, or
     - Is an employee of the Facility Owner or Operator

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Facility Registration for Operation & Implementation Fees

Refrigerant Charge Size Category	Facility Registration Due Date	Facility Implementation Fee
Facilities with Large Systems *(Refrigerant Full Charge Greater than 2,000 lbs)*	August 31, 2011	$370
Facilities with Medium Systems *(Refrigerant Full Charge Greater than 200 lbs and Less than 2,000)*	August 31, 2013	$170
Facilities with Small Systems *(Refrigerant Full Charge Greater than 50 lbs and Less than 200)*	July 1, 2014	$25 to $100

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Facility Reporting & Recordkeeping

- Annual Report
  - Report of Refrigeration and Air-conditioning Service and Leak Repairs
  - Report of Refrigerant Purchased and Used
- Recordkeeping - records retained for 5 years
  - Records to support required annual reports
  - Documentation of all leak detection systems
  - Records of all service and refrigerant repairs

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Other Draft Rule Sections

- **§ 95385. Confidentiality**
- **§ 95386. Enforcement**
- **§ 95387. Sunset Provision**
- **§ 95388. Conditional Exemptions**

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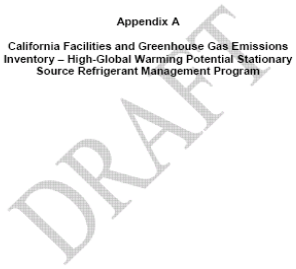
Emissions Inventory Methods & Discussion (Appendix A)



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Emissions Inventory Data Sources

Data sources used to estimate emissions and potential emission reductions:

- International: IPCC "Safeguarding the Ozone Layer and the Global Climate System"; and United Nations Refrigerant Technical Options Committee Reports
- National: U.S. EPA Vintaging Model estimates of national emissions from CFCs, HCFCs, and HFCs; and Commercial Building Energy Consumption Survey
- State: California Energy Commission (Commercial End Use Survey); ARMINES Commercial Refrigeration Study
- Regional: South Coast Air Quality Management District Rule 1415 Biannual Reporting on refrigerant usage

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Emissions Inventory Method (Appendix A)

Statewide emission estimates extrapolated from available data (SCAQMD Rule 1415 data primarily) :

- Types of facilities and numbers extrapolated
- Types of refrigeration and A/C systems and their numbers extrapolated
- Emissions/system determined from: types of refrigerant used, pounds charge/system, average leak rates and pounds lost per year
- Statewide Emissions = number of systems statewide x average emissions/system

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Emissions and Relation to Refrigerant Charge Size Categories

Goal: Focus on Highest Potential Emissions Based on Charge Size and Emissions per System

1) Large (≥ 2,000 lbs) systems have the greatest average emissions per system (250 lbs/yr) from:
   - Process Cooling
   - Cold Storage
   - Centralized Refrigeration
2) Medium (≥ 200 lbs, <2,000 lbs) systems have lower average emissions per system (50 lbs/yr)
3) Small (≥ 50 lbs, <200 lbs) systems have lowest average emissions per system (10 lbs/yr)

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Chillers: Exception to "Large Refrigerant Charge Size Equal to High Emissions"

- Chillers used for A/C were an exception to the general rule "larger charge size = higher annual emissions"
- ARB may consider annual reporting of all AC equipment including chillers (any size) to begin in 2014 same as small charge size systems
- Discussion at end of presentation welcome

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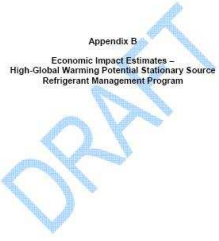
Cost Analysis & Effectiveness Methods & Discussion (Appendix B)



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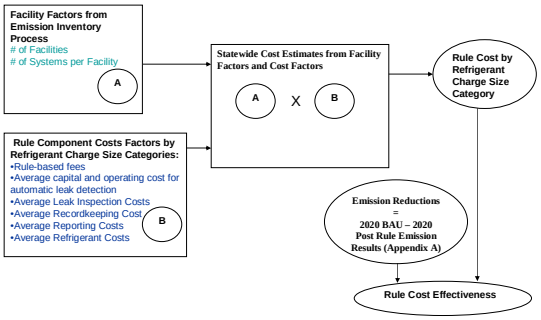
Cost Analysis & Effectiveness Method (Appendix B)



Facility Registration & Leak Repair Cost Analysis Comments and Assumptions

- *Cost Analysis Comments and Assumptions (Large, Medium, Small)*
  - *All assumptions are based on estimated ranges, the numbers provided indicate a mid-range of total potential estimates*
  - *Total annualized cost reduced by refrigerant saved at $11/pound*

Annual cost	Large systems	Medium Systems	Small systems
Implementation fee	$370	$170	$0 *
Leak detection equipment	$917 annually capital cost ($8,130 annualized over 12 years) $720 annual operating cost	$0	$0
Leak inspection cost	$150 annual audit	$300 quarterly inspection	$75 annual inspection
Leak repair cost	$2,450 + refrigerant recharge (~$1,650)	$1,550 + refrigerant recharge (~$253)	$900 + refrigerant recharge (~$44)
Reporting and recordkeeping	$465	$449	$116

** one-time registration fee of $25 - $100 being considered*

Statewide Annual Cost of Proposed Rule (2020)

	Annual cost (HFC and ODS) ($ millions)	Annual cost (HFC Only) ($ millions)
Annual Costs		
Implementation	$16	$12
Reporting and recordkeeping	$57	$46
Leak inspection	$187	$149
Automatic leak detection and monitoring		
Capital costs	$20	$16
Annual maintenance	$16	$13
Repair (labor, parts, and refrigerant recharge)	$25	$20
Refrigerant savings	$194	$155
Net cost	$128	$101
Potential Emission Reductions	15 $MMTCO_2E$	12 $MMTCO_2E$
Cost-effectiveness	$8/$MTCO_2E$	$8/$MTCO_2E$

Example Case Studies (1)
(2020 HFC Only)

Facility Description:
- Large office building
- Three systems – two large (2680 lbs, 2120 lbs) and one medium (750 lbs)
- Air-conditioning

Facility Registration and Leak Repair Based on 2020 Emission Reductions	
Facility Cost	
Annual Fees	$370
Automatic Leak Detection & Monitoring capitol and operating cost	$3,280
Leak Repair	$270
Reporting and Recordkeeping and system inspection/audit cost	$1,060
Annual Cost	**$4,980**
Refrigerant Savings	**$2,710**
Net Annual Costs	**$2,270**
Estimated Emission Reduction ($MTCO_2E$)	**196**
Cost Effectiveness ($/MTCO_2E$)	**$12**

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Example Case Studies (2)
(2020 HFC Only)

Facility Description:
- Modern supermarket
- Four medium (1100 lb) systems
- Centralized system for refrigeration and air-conditioning

Facility Registration and Leak Repair Based on 2020 Emission Reductions	
Facility Cost	
Annual Fees	$170
Automatic Leak Detection & Monitoring capitol and operating cost	$0
Leak Repair	$130
Reporting and Recordkeeping and system inspection/audit cost	$1,650
Annual Cost	**$1,950**
Refrigerant Savings	**$1,130**
Net Annual Costs	**$820**
Estimated Emission Reduction ($MTCO_2E$)	**98**
Cost Effectiveness ($/MTCO_2E$)	**$8**

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Refrigerant Management Program Rulemaking Process Timeline & Next Steps

Primary Task	**Timeframe**
4th Technical Workgroup Meeting	**January 14 , 2009**
Released Emission Inventory and Cost Estimates Document	**January 26, 2009**
Hold Statewide Public Workshops	**February 3 – Diamond Bar** **February 5 – Modesto** **February 10 – Sac (Webcast)**
Public Comments Due on Appendices and Draft Rule	**February 13, 2009**
Public Release for 45-day comment Period	**April 10, 2009**
Board Meeting	**May 28, 2009**

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Summary of Staff Recommendation Recent & Considered Changes

- Proposed Rule Changes:
  - Eliminate the registration fee
  - Incorporated facility registration with annual report requirement (first year reporting only)
  - Initiate implementation fee due with annual reports
  - Remove reporting requirement for small systems (i.e. 50-200lbs. refrigerant charge size)
  - Remove requirement for deposits on refrigerant cylinders; require cylinder evacuation prior to recycling or disposal.

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Summary of Staff Proposals Under Consideration

- Postpone Registration for Operation and Reporting of all air-conditioning systems with a refrigerant charge 200 pounds or greater to after fiscal year 2014.
- Add a regulatory or voluntary framework to ensure certified technicians are trained and certified to adhere to best management practices for refrigerant management.

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Outstanding Issues

- Air District Implementation
- Reporting and Payment System and Database
- Proposals Under Consideration
  - Postponing Registration for Operation and Reporting for air-conditioning systems with a refrigerant charge 200 pounds or greater to after fiscal year 2014.
  - Adding a regulatory or voluntary framework to ensure certified technicians are trained and certified to adhere to best management practices

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Contact Info

Refrigerant Management Program Internet Resources:

- Website: http://www.arb.ca.gov/cc/reftrack/reftrack.htm
- List serve: http://www.arb.ca.gov/listserv/listserv.php

ARB Staff Contacts

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